Pavement Preservation School

Welcome!

Presented By:
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Agenda

• What is Pavement Preservation
• Asphalt Distresses
• Concrete Distresses
• Pavement Preservation Treatments
• Putting it all together!
What is Pavement Preservation?

1. How do you define Pavement Preservation?

2. What types of treatments do you define as Pavement Preservation?

3. How do you think Crafco fits into the Pavement Preservation industry?
Pavement Preservation
Pavement Preservation is "a program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations." Source: FHWA Pavement Preservation Expert Task Group

Pavement Preservation Video
Pavement Preservation Benefits

• An effective pavement preservation program will address pavements while they are still in good condition and before the onset of serious damage.

  • By applying a cost-effective treatment at the right time, the pavement is restored almost to its original condition.

  • A proper pavement preservation system postpones costly rehabilitation and reconstruction.

    • During the life of a pavement, the series of pavement preservation treatments is substantially less than the more extensive, higher cost of reconstruction the cost of major rehabilitation.

    • Pavement preservation treatments during the life of a pavement is less disruptive to uniform traffic flow than the long closures normally associated with reconstruction projects.
Why Pavement Preservation?

1. Preserves investment in our infrastructure
2. Enhances pavement performance
3. Ensures cost-effectiveness
4. Extends pavement life
5. Reduces user delays
6. Provides improved safety and mobility

“This is the true goal of pavement preservation, a goal in which the FHWA, through its partnership with States, local agencies, industry organizations, and other interested stakeholders, is committed to achieve”
Pavement preservation is a combination of different strategies when taken together, achieve a single goal.
Minor Rehabilitation

Minor rehabilitation “consists of non-structural enhancements made to the existing pavement sections to eliminate age-related, top-down surface cracking that develop in flexible pavements due to environmental exposure. Because of the non-structural nature of minor rehabilitation techniques, these types of rehabilitation techniques are placed in the category of pavement preservation.”

In contrast, Major/other pavement rehabilitation projects are NOT considered pavement preservation: Major rehabilitation "consists of structural enhancements that both extend the service life of an existing pavement and/or improve its load-carrying capability." Source: AASHTO Highway Subcommittee on Maintenance Definition
Preventive Maintenance is "a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity)." Source: AASHTO Standing Committee on Highways, 1997
Preventive Maintenance

Preventive maintenance is typically applied to pavements in good condition having significant remaining service life. As a major component of pavement preservation, preventive maintenance is a strategy of extending the service life by applying cost-effective treatments to the surface or near-surface of structurally sound pavements.

- crack sealing
- chip sealing
- slurry or micro-surfacing
- thin and ultra-thin hot-mix asphalt overlay
- concrete joint sealing
- diamond grinding
- dowel-bar retrofit, and isolated partial and/or full-depth concrete repairs to restore functionality of the slab
  » edge spalls, or corner breaks.
Routine Maintenance

- Routine Maintenance "consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service." Source: AASHTO Highway Subcommittee on Maintenance

- cleaning of roadside ditches and structures
- maintenance of pavement markings
- pothole patching and isolated overlays
- crack filling
Pavement Preservation Treatments

• Crack Sealing, Crack Filling, Joint Sealing
• Patching
• Chip Seal
• Fog Seal
• Slurry Seal
• Micro-surfacing
• Overlays

We will discuss each of these in detail today
Questions?
Asphalt (AC) Pavements & Distresses
Asphalt Concrete

- Asphalt Layer
- Base Layer
- Subgrade Layer
Asphalt Layer

- Composed of Asphalt Cement (Glue) and Aggregate
- Driving Surface
  - Load Support, wear resistance
Base Layer

- Asphalt Concrete
- Compacted Aggregate
- Provides Thickness
- Spreads Forces
Subgrade Layer

- Underlying soil
- Strength Affected by moisture

THIS IS ULTIMATELY, WHAT WE ARE TRYING TO PROTECT THROUGH PAVEMENT PRESERVATION!
Distresses

Deterioration:
• Natural process due to environmental, loading, and materials effects.
• Process occurs differently in different environmental and loading situations
• Distress include cracking, surface raveling, rutting, potholes
• Accelerates as pavements get older.
Asphalt Distress Types

1. Cracking
2. Patching and Potholes
3. Surface Deformation
4. Surface Defects
5. Miscellaneous Distresses
Cracking

- Fatigue
- Block
- Edge
- Longitudinal
  - Wheel path
  - Non-wheel path
- Transverse
  - Thermal
  - Reflective
Crack Formation and Types

- Cracks occur when the AC is no longer flexible enough to resist weather/traffic
  - Traffic loadings
  - Seasonal temperature changes

- Asphalt concrete is most flexible and resistant to cracking at construction
Fatigue

- Fatigue cracks are also known as “alligator” cracks
- Indication of structural failure
- Typically occurs later in a pavement’s life due to high traffic loads
- Crack seal or fill cracks larger than 1/8” (3mm) as a pre-treatment to other surface treatments
Block

- Block cracks typically form in older pavement
  - Hardening of asphalt
  - Thermal effects/shrinkage of asphalt during cold weather
  - Form in traffic and non-traffic areas
- Effectively treated by crack sealing 16
Edge

- Edge cracks typically form due to:
  - Lack of lateral support
  - Settlement of underlying material
  - Weak Base
  - Heavy traffic along edge

- Prevent intrusion of run off water and debris by crack sealing
Longitudinal cracks run parallel to the pavement lane
- Construction Joint
- Thermal/Reflective
- Wheel path

Typically caused by construction of pavement joint, thermal conditions, and traffic loading

Crack Sealing (and routing when appropriate) is recommended to prevent intrusion of moisture and debris.
Transverse

- Transverse cracks form perpendicular to the pavement lane
  - Thermal
  - Reflective (Reflection)

- Typically caused by environmental factors and by reflection of underlying joints

- Often experience concentrated and extreme movement

- Crack Sealing (and routing when appropriate) is recommended to accommodate the expected crack movement
Patching and Potholes

• Patch / Patch Deterioration
• Potholes
Patch/Patch Deterioration

Portion of pavement surface, greater than 0.1 m², that has been removed and replaced or additional material applied to the pavement after original construction.
Patch/Patch Deterioration

Low Severity:
• Low visible distress/rutting <6mm
• No pumping

Moderate Severity
• Moderate visible distress/rutting 6 -12mm
• No pumping

High Severity
• High visible distress rutting >12mm
• Additional patch material within patch
• Pumping may be evident
Potholes

Bowl-shaped holes of various sizes in the pavement surface (minimum 150mm)

FIGURE 26
Distress Type ACP 8—Potholes
Potholes

Low severity:  
<25mm deep

Moderate severity:  
25mm-50mm deep

High severity:  
>50mm deep
Surface Deformation

- Rutting
- Shoving
Rutting

A rut is a longitudinal surface depression in the wheel path. It may have associated transverse displacement.
Shoving

Shoving is a longitudinal displacement of a localized area of the pavement surface. It is generally caused by braking or accelerating vehicles, and is usually located on hills or curves, or at intersections. It also may have associated vertical displacement.
Surface Defects

- Bleeding
- Polished Aggregate
- Raveling
Bleeding

Excess bituminous binder occurring on the pavement surface, usually found in the wheel paths.

- surface discolored relative to the remainder of the pavement
- losing surface texture because of excess asphalt
- aggregate may be obscured by excess asphalt possibly with a shiny, glass-like, reflective surface that may be tacky to the touch.
Polished Aggregate

Surface binder worn away
to expose coarse aggregate

Degree of polishing may be reflected in reduction of surface friction
Raveling

Wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of asphalt binder. Raveling ranges from loss of fines to loss of some coarse aggregate and ultimately to a very rough and pitted surface with obvious loss of aggregate.
Miscellaneous Distresses

• Lane-to-Shoulder Drop-off
• Water Bleeding and Pumping
Lane-to-Shoulder Dropoff

Difference in elevation between the traveled surface and the outside shoulder. Typically occurs when the outside shoulder settles as a result of pavement layer material differences.
Water Bleeding/Pumping

Seeping or ejection of water from beneath the pavement through cracks. In some cases, detectable by deposits of fine material left on the pavement surface, which were eroded (pumped) from the support layers and have stained the surface.
Questions?
Concrete (PCC) & Distresses
Concrete

Portland Cement Concrete (PCC) Components

- Portland Cement
- Coarse Aggregate
- Sand
- Water
- Air
- Admixtures
Concrete Distress Types

1. Cracking
2. Joint Deficiencies
3. Surface Defects
4. Miscellaneous Distresses
Cracking

- Corner Breaks
- D Cracking
- Longitudinal
- Transverse
Corner Breaks

A portion of the slab separated by a crack, which intersects the adjacent transverse and longitudinal joints, describing approximately a 45-degree angle with the direction of traffic. The length of the sides is from 0.3 m to one-half the width of the slab on each side of the corner.
Corner Breaks

Low Severity:
• Crack not spalled for more than 10% of its total length
• No measureable faulting; corner piece is not broken into 2 or more pieces
• No loss of material; no patching

Moderate Severity:
• Crack is spalled for more than 10% of its total length
• Faulting of crack/joint is <13mm and corner piece is not broken into two or more pieces

High Severity:
• Crack is spalled moderate to high severity for more than 10% of its total length
• Faulting of crack/joint is ≥ 13 mm; or the corner piece is broken into two or more pieces or contains patch material.
“D Cracking”

Closely spaced crescent-shaped hairline cracking pattern.

Occurs adjacent to joints, cracks, or free edges; initiating in slab corners.

Dark coloring of the cracking pattern and surrounding area.
Longitudinal

Cracks that are predominantly parallel to the pavement centerline.

Low Severity:
• Crack width <3mm
• No spalling/faulting
• Well sealed

Moderate Severity:
• Crack width ≥ 3 mm and < 13 mm
• Spalling <75mm
• Faulting up to 13 mm

High Severity:
• Crack width ≥ 13 mm
• Spalling ≥ 75 mm; or faulting ≥ 13 mm
Transverse

Cracks that are predominantly perpendicular to the pavement centerline.

LOW Severity:
• Crack widths < 3 mm
• no spalling/faulting
• well-sealed

MODERATE Severity:
• Crack widths ≥ 3 mm and < 6 mm
• spalling < 75 mm; or faulting up to 6 mm.

HIGH Severity:
• Crack widths ≥ 6 mm
• spalling ≥ 75 mm; or faulting ≥ 6 mm.
Joint Deficiencies

• **Joint Seal Damage**
  – Longitudinal
  – Transverse

• **Spalling**
  – Longitudinal
  – Transverse
Joint Seal Damage

Joint seal damage is any condition which enables incompressible materials or water to infiltrate the joint from the surface. Typical types of joint seal damage are: Extrusion, hardening, adhesive failure (bonding), cohesive failure (splitting), or complete loss of sealant. Intrusion of foreign material in the joint. Weed growth in the joint.
Spalling

Cracking, breaking, chipping, or fraying of slab edges within 0.3 m from the face of the joint.

FIGURE 64
JCP 6. Low Severity Spalling of Longitudinal Joint
Surface Defects

- Map Cracking
- Scaling
- Polished Aggregate
- Popouts
Map Cracking

A series of cracks that extend only into the upper surface of the slab. Larger cracks frequently are oriented in the longitudinal direction of the pavement and are interconnected by finer transverse or random cracks.
Scaling

Scaling is the deterioration of the upper concrete slab surface, normally 3 mm to 13 mm, and may occur anywhere over the pavement.

FIGURE 70
JCP 8b. Scaling
Polished Aggregate

Surface mortar and texturing worn away to expose coarse aggregate.

The degree of polishing may be reflected in a reduction of surface friction.
Popouts

Small pieces of pavement broken loose from the surface, normally ranging in diameter from 25 mm to 100 mm, and depth from 13 mm to 50 mm.

FIGURE 105
CRCP 6. Popouts
Miscellaneous Distress

- Blowups
- Joint/Crack Faulting
- Shoulder Drop-off
- Shoulder Separation
- Patch Deterioration
- Water Bleeding and Pumping
Blowups

Localized upward movement of the pavement surface at transverse joints or cracks, often accompanied by shattering of the concrete in that area.
Joint/Crack Faulting

Difference in elevation across a joint or crack
Should Drop-off

Difference in elevation between the edge of slab and outside shoulder; typically occurs when the outside shoulder settles.
Shoulder Separation

Widening of the joint between the edge of the slab and the shoulder.
Patch Deterioration

A portion, greater than 0.1 m², or all of the original concrete slab that has been removed and replaced, or additional material applied to the pavement after original construction.
Water Bleeding / Pumping

Seeping or ejection of water from beneath the pavement through cracks or joints. In some cases detectable by deposits of fine material left on the pavement surface, which were eroded (pumped) from the support layers and have stained the surface.
Questions?
Pavement Preservation Treatments
Pavement Preservation Treatments

- Crack Sealing, Crack Filling, Joint Sealing
- Patching
- Chip Seal
- Fog Seal
- Slurry Seal
- Micro-surfacing
- Thin functional & Maintenance overlays
- Ultra Thin, Hot-mixed, Bonded overlays
Crack & Joint Sealing

• Crack sealing and filling prevent the intrusion of water and incompressible materials into cracks. The methods vary in the amount of crack preparation required and the types of sealant materials that are used.

• Crack sealing is the placement of materials into working cracks. Crack sealing requires thorough crack preparation and often requires specialized high quality materials placed either into or above working cracks to prevent the intrusion of water and incompressible materials. Crack sealing is generally considered to be a longer-term treatment than crack filling.

Crack Rout and Seal Video
Patching

- Patching is one of the most expensive of the maintenance procedures for hot-mix asphalt (HMA) pavements, (per unit of measure, i.e. cost/ton, cost/in$^2$, cost/yd$^2$). It is often done in preparation for other forms of corrective maintenance, pavement preservation, or pre-treatment prior to an overlay.

- Primary methods of patching include the replacement of materials that have been lost due to localized pavement distress or disintegration, the complete removal (dig out) and replacement of continuous segments of failed pavement.

HP Asphalt Patching Repair

Mastic Applications
Chip Seal

Chip sealing is the application of a bituminous binder immediately followed by the application of an aggregate. The aggregate is then embedded into the binder using pneumatic-tired rollers. (This is commonly referred to as “rolling,” but is not intended to imply that the aggregate is rolled by the rollers.) Multiple layers may be placed and various binder and aggregate types can be used to address specific distress modes or traffic situations.

Chip Seal Application Video
Fog Seal

Fog seals are a method of adding asphalt to an existing pavement surface to improve sealing or waterproofing, prevent further stone loss by holding aggregate in place, or simply improve the surface appearance. However, inappropriate use can result in slick pavements and tracking of excess material.

Fog Seal Application
Slurry Seal

- Slurry seal is a thin surface treatment that is laid in a thickness equal to the largest stone in the grading of its component aggregate. It may include either a conventional or polymer modified emulsion, and the slurry seal may be slow or quick setting. A slurry surfacing does not add any structural capacity to an existing pavement; they are applied as a maintenance treatment to improve the functional characteristics of the pavement surface.

Slurry Seal Video
Micro-surfacing

Micro-surfacing is a thin surfacing, and can be laid at two to three times the thickness of the largest stone in the grading. The emulsion in the system is always polymer modified and special additives are used to create a chemical break that is largely independent of weather conditions.

Such systems can often be opened to traffic within 1 hour or less of its application under a range of conditions (1).

Micro-surfacing is not intended as a crack treatment and will not prevent cracks in the underlying pavement from reflecting through to the surface.
Thin Functional & Maintenance Overlays

- For the purposes of this session, functional overlays are defined as thin treatments using a hot mix system that is a non-structural layer and is applied as a preservation or maintenance treatment, either corrective or preventive. Nationally, thin treatments are less than 37.5 mm (1.5 inches) in thickness.

- Dense Graded
- Gap Graded
- Open Graded

Thin Overlay Video #2
Ultra Thin, Hot-Mixed, Bonded Overlays

- A bonded wearing course (BWC) is a gap graded, ultra thin hot-mix asphalt (HMA) mixture applied over a thick polymer-modified asphalt emulsion membrane. The emulsion membrane seals the existing surface and produces high binder content at the interface of the existing roadway surface and the gap-graded mix all in one pass. The gap-graded HMA provides an open surface texture to allow water to flow through the surface. A BWC can be applied and opened to traffic quickly, usually within 15 minutes, without sanding or tracking. Bonded wearing courses are primarily used in high traffic areas as a surface treatment over HMA and PCC surfaces. It can be placed over structurally sound pavements as a maintenance treatment, and may also be used in new construction and rehabilitation projects as the final wearing course.

Bonded Overlay Video
Questions?
Why Pavement Preservation?
When cracks in asphalt and concrete are not treated, it can lead to exceedingly costly repairs as well as unsafe driving conditions.

Treated cracks can extend the life of pavement 3-5 years.
Why Pavement Preservation?

Treat cracks before the pavement turns into this..
Crafco is the world’s leading manufacturer of packaged *pavement preservation* products for asphalt and concrete, such as hot-pour crack and joint sealants, hot-pour mastics, and cold-mix for pavement surface patching and repair.

Crafco is the only company that manufactures these types of products *and* the equipment to apply them.
Crafco Leads the Industry

Crafco is the world’s largest developer of innovative, proven-effective, packaged pavement preservation materials.
Crafco Leads the Industry

Crafco is the world’s largest producer of state-of-the-art, specialized pavement preservation equipment.
Crafco Leads the Industry

Crafco is the world’s only company that manufactures pavement preservation packaged materials AND the equipment used to apply them.
Since 1976, Crafco has been leading the industry in developing products for both asphalt and concrete repair anywhere in the world.
From its humble beginnings in 1976, Crafco has grown to lead a new and ever-expanding market segment of packaged pavement preservation products, becoming the world’s largest supplier of crack sealant and crack filler. Crafco sealants can be found in use in every state of the US and around the world including China, South America, Siberia, performing in all climatic conditions.
Crafco in the U.S.

- Corporate headquarters
- 1 Equipment plant
- 5 Sealant plants
- 13 Retail locations

PAVEMENT PRESERVATION ACROSS THE U.S.
Crafco manufactures over 100 different types of crack sealants to accommodate various specifications, applications and regions.
There are a variety of joint sealants. The most widely used are: Silicone, Hot Pour, Urethane and Preformed. Crafco manufactures Hot Pour and Silicone.
Types of Silicone

NON-SAG

SELF-LEVELING
Non-Sag Silicone Characteristics

- Light Gray
- Horizontal or Inclined Application
- Low Modulus/Higher Flexibility
- Requires Tooling
- Rehab or New Pavements
- Seals Small Spalled areas in Joint Walls
- Tack Free in 25 to 90 mins.
- Full Cure through in 14 days
Self-Leveling Silicone Characteristics

- Dark Grey
- Horizontal application only
- 6% maximum grade
- Low Modulus/higher flexibility
- Neat Seal - No Tooling
- Rehab or new pavements
- Tack Free in 3 hours max
- Full Cure through in 21 days
The joint area is weaker under traffic, and susceptible to premature deterioration from water and air exposure. Joint Adhesive increases durability and service life of joints through improved bonding and sealing.
Waterproofing
GeoComposites
Reinforce cracks and joints
GeoComposites
Bridge waterproofing and preservation
What is Ultraseal?

The Ultraseal Waterproofing System is a built-up, multilayer system used to protect the bridge deck surface from water penetration, salt, chlorides, and other harmful destructive elements.

This seamless, fully-bonded system protects the bridge superstructure from deterioration by preventing water from delivering corrosive materials into the deck.
Concrete Patching Products
What is TechCrete?

TechCrete is the most advanced flexible concrete solution for highway and airport pavement rehabilitation!

TechCrete is gray in color and aesthetically suitable for all concrete pavements and is used in sealing wide cracks and joints, and repairing a large variety of pavement distresses in portland cement concrete pavement (PCCP) and asphalt concrete pavement.
TechCrete Applications

D cracking (due to freeze/thaw)
TechCrete Applications

Multi-Corner Slab Repair

Corner Breaks
TechCrete Applications
Spalls & Pop-outs
What is HP Concrete Patch?

HP Concrete Patch is a unique, gray colored, cold applied, single component concrete patching material.
HP Concrete Patch Applications

- Distresses over 1” (in.) wide and greater than ½” (in.) deep.
- Roads, Highways, Streets, and Parking lots
- Bridges (joints and deck spalls)
- Alternative asphalt pavement repair solution
- Airports
What is Mastic?

A hot applied pourable, aggregate-filled, flexible, self-adhesive patching material used for maintenance and repair of asphalt and concrete pavements.
Mastics Composition

Binder - Asphalt modified with Polymers and oils to better resist shoving and cracking.

Aggregate – designed to provide mass and stability for compression resistance and to meet load bearing requirements, while still allowing the material to flow.
Mastic Applications

Repair wide cracks
Mastic Applications

Repair longitudinal cracks
Cold patch, also known as cold mix, was first recognized as a way to make road repairs quickly because it can be applied right from the container without heating.
Patching Repairs

Patches; potholes, cupped cracks and distresses at railroad crossings
Utility Cuts

Patches various utility distresses such as manholes, values, and utility cuts in pavements
Asphaltic Plug Joints
What is Matrix?

Crafco manufactures two types of asphaltic plug joint systems:

**Matrix 501**: pre-measured, prepackaged blend

**Matrix 502**: engineered for all climates; field blended
Matrix Products

Matrix 501

- Blend of polymer modified asphalt with select aggregate
- Prepackaged / premeasured
- Waterproof system
- Smooth, quiet ride
- Meets ASTM Specification-D6297

Matrix 501 eliminates the measuring, proportioning and field mixing required with traditional plug joint systems
Marker Adhesive
Traffic Loop and Marker Adhesive

Traffic Loop Sealant provides total and permanent protection of traffic control loop wires in both asphalt and concrete.

Marker adhesive is a hot-applied material that bonds markers and reflectors to pavement surfaces.
Quality • Success • People • Integrity • Relationships • Innovation • Tidy

Qwik Products
**QWIKSEAL**

Is a peel and stick, modified asphalt compound ideal for sealing cracks, seams around pavement patches and joints.

**QWIKDOTS**

Pressure sensitive peel and stick modified asphalt adhesive pads adhere sign posts, rumble strips, speed bumps, parking bumpers, temporary signs or most anything else to both concrete and asphalt pavements.

**QWIKSTIX**

Adhesive sealant is a fast and easy way to adhere pavement markers or do small crack repairs. The only tool required is a small torch. The QWIKSTIX is ideal for applying single markers or touch up to a crack sealing project.
An economical, biodegradable liquid in our Crafco Detack that eliminates sealant tack when sprayed onto freshly applied hot pour sealant.